

Claims

- [c1] 1. A data cartridge library comprising:
- a frame;
 - a data cartridge magazine, operatively attached to said frame, for providing a plurality of data cartridge storage spaces;
 - a drive, operatively attached to said frame, for writing data onto a recording medium located within a data cartridge and/or reading data from a recording medium located within a data cartridge;
 - a picker, operatively attached to said frame, that is capable of grasping a data cartridge, releasing a grasped data cartridge, inserting a grasped data cartridge into a data cartridge storage space in said data cartridge magazine, inserting a grasped data cartridge into said drive, retracting a grasped data cartridge from a data cartridge storage space in said data cartridge magazine, and retracting a grasped data cartridge from said drive; and
 - an elevator, operatively attached to said frame, for moving said picker such that said picker can perform grasping, retracting and inserting operations in the moving of a data cartridge between any one of said data cartridge storage spaces and said drive;

wherein said picker comprises:

a base plate that is operatively connected to said elevator;

a grasper, operatively connected to said base plate, with a pair of members that are capable of being placed in a closed position that is suitable for grasping a data cartridge and an open position that is suitable for releasing a grasped data cartridge;

wherein said grasper comprises a grasper cam follower;

a crank that is operatively connected to said base plate so as to be capable of rotating about an axis;

a grasper cam driver, operatively connected to said crank, for cooperating with said grasper cam follower to manipulate at least one of said pair of members so as to place said pair of members in at least one of said open and closed positions;

wherein said crank is capable of being used to rotate said grasper cam driver through a range;

wherein for a first portion said range, said grasper cam driver and said grasper cam follower operate to place said members in one of said open state and said closed state; and

wherein for a second portion of said range that does not substantially overlap with said first portion of said range, said grasper cam driver and said grasper cam operate to place said members in the other of said open state and

said closed state.

- [c2] 2. A data cartridge library, as claimed in claim 1,
wherein:
said first portion of said range is less than 180 degrees;
and
said second portion of said range is less than 180 de-
grees.
- [c3] 3. A data cartridge library, as claimed in claim 1,
wherein:
said first portion of said range is more than 180 degrees;
and
said second portion of said range is less than 180 de-
grees.
- [c4] 4. A data cartridge library, as claimed in claim 1,
wherein:
said first portion of said range is approximately 180 de-
grees; and
said second portion of said range is approximately 180
degrees.
- [c5] 5. A data cartridge library, as claimed in claim 1,
wherein:
said crank is capable of being used to rotate said grasper
cam driver through a range of more than 180 about said

axis.

- [c6] 6. A data cartridge library, as claimed in claim 1, wherein:
said grasper cam driver has a surface vector that is not substantially perpendicular to said axis.
- [c7] 7. A data cartridge library comprising:
a frame;
a data cartridge magazine, operatively attached to said frame, for providing a plurality of data cartridge storage spaces;
a drive, operatively attached to said frame, for writing data onto a recording medium located within a data cartridge and/or reading data from a recording medium located within a data cartridge;
a picker, operatively attached to said frame, that is capable of grasping a data cartridge, releasing a grasped data cartridge, inserting a grasped data cartridge into a data cartridge storage space in said data cartridge magazine, inserting a grasped data cartridge into said drive, retracting a grasped data cartridge from a data cartridge storage space in said data cartridge magazine, and retracting a grasped data cartridge from said drive; and
an elevator, operatively attached to said frame, for moving said picker such that said picker can perform grasping, retracting and inserting operations in the moving of

a data cartridge between any one of said data cartridge storage spaces and said drive;
wherein said picker comprises:
a base plate that is operatively connected to said elevator;
a grasper, operatively connected to said base plate, with a pair of members that are capable of being placed in a closed position that is suitable for grasping a data cartridge and an open position that is suitable for releasing a grasped data cartridge;
wherein said grasper comprises a grasper cam follower;
a crank that is operatively connected to said base plate so as to be capable of rotating about an axis;
a grasper cam driver, operatively connected to said crank, for cooperating with said grasper cam follower to manipulate at least one of said pair of members so as to place said pair of members in at least one of said open and closed positions;
wherein said crank is capable of being used to rotate said grasper cam driver through a range of more than 180 degrees about said axis.

- [c8] 8. A data cartridge library, as claimed in claim 7,
wherein:
when said crank is rotated through said range, said grasper cam driver contacts said grasper cam follower

over a first sub-range of said range.

- [c9] 9. A data cartridge library, as claimed in claim 8,
wherein:
when said grasper cam driver and said grasper cam follower are in said first sub-range, said pair of members of said grasper are in said closed position.
- [c10] 10. A data cartridge library, as claimed in claim 8,
wherein:
when said grasper cam driver and said grasper cam follower are in said first sub-range, said pair of members of said grasper are in said open position.
- [c11] 11. A data cartridge library, as claimed in claim 8,
wherein:
said grasper cam driver does not contact said grasper cam follower over a second sub-range of said range that is different than said first sub-range of said range.
- [c12] 12. A data cartridge library, as claimed in claim 11,
wherein:
said first sub-range and said second sub-range do not substantially overlap.
- [c13] 13. A data cartridge library, as claimed in claim 11, further comprising:
a sensor for use in determining whether said grasper

cam driver and grasper cam follower are in said first or second sub-range.

[c14] 14. A data cartridge library, as claimed in claim 7, wherein:
said range is 360 degrees about said axis.

[c15] 15. A data cartridge library, as claimed in claim 14, wherein:
when said crank is rotated through said range, said grasper cam driver contacts said grasper cam follower over a sub-range of only about 180 degrees of rotation of said crank.

[c16] 16. A data cartridge library, as claimed in claim 14, wherein:
when said crank is rotated through said range, said grasper cam driver does not contact said grasper cam follower over a range of only about 180 degrees of rotation of said crank.

[c17] 17. A data cartridge library, as claimed in claim 7, wherein:
said crank is capable of being used to rotate said grasper cam driver in a clockwise and a counter-clockwise direction about said axis.

[c18] 18. A data cartridge library, as claimed in claim 7,

wherein:

said picker further comprising:

a pusher plate that is operatively connected to said base plate such that said pusher plate is capable of moving between first and second positions relative to said base plate;

wherein said grasper is operatively connected to said pusher plate;

wherein said pusher plate comprises a pusher plate cam follower;

a pusher plate cam driver that is capable of engaging said pusher plate cam follower so as to move said pusher plate between said first and second positions.

[c19] 19. A data cartridge library, as claimed in claim 18,

wherein:

said pusher plate cam driver is operatively connected to said crank.

[c20] 20. A data cartridge library, as claimed in claim 18,

wherein:

said pusher plate cam driver has a surface vector that is substantially perpendicular to said axis; and

said grasper cam driver has a surface vector that is not substantially perpendicular to said axis.

[c21] 21. A data cartridge library, as claimed in claim 7,

wherein:

at least one of said pair of members is constrained to move in a direction with a component vector that is substantially parallel to said axis.

[c22] 22. A data cartridge library, as claimed in claim 7,

wherein:

at least one of said pair of members is constrained to rotate about a member axis that is substantially perpendicular to said axis.

[c23] 23. A data cartridge library, as claimed in claim 7,

wherein:

said grasper cam driver has a surface vector that is not substantially perpendicular to said axis.

[c24] 24. A data cartridge library comprising:

a frame;

a data cartridge magazine, operatively attached to said frame, for providing a plurality of data cartridge storage spaces;

a drive, operatively attached to said frame, for writing data onto a recording medium located within a data cartridge and/or reading data from a recording medium located within a data cartridge;

a picker, operatively attached to said frame, that is capable of grasping a data cartridge, releasing a grasped data

cartridge, inserting a grasped data cartridge into a data cartridge storage space in said data cartridge magazine, inserting a grasped data cartridge into said drive, retracting a grasped data cartridge from a data cartridge storage space in said data cartridge magazine, and retracting a grasped data cartridge from said drive; and an elevator, operatively attached to said frame, for moving said picker such that said picker can perform grasping, retracting and inserting operations in the moving of a data cartridge between any one of said data cartridge storage spaces and said drive;

wherein said picker comprises:

a base plate that is operatively connected to said elevator;

a grasper, operatively connected to said base plate, with a pair of members that are capable of being placed in a closed position that is suitable for grasping a data cartridge and an open position that is suitable for releasing a grasped data cartridge;

wherein said grasper comprises a grasper cam follower;

a crank that is operatively connected to said base plate so as to be capable of rotating about an axis;

a grasper cam driver, operatively connected to said crank, for cooperating with said grasper cam follower to manipulate at least one of said pair of members so as to place said pair of members in at least one of said open

and closed positions;

wherein said grasper cam driver has a surface vector that is not substantially perpendicular to said axis.

[c25] 25. A data cartridge library, as claimed in claim 24,
wherein:

said grasper cam follower has a grasper cam follower surface vector that is not substantially perpendicular to said axis.

[c26] 26. A data cartridge library, as claimed in claim 24,
wherein:

said grasper cam driver has a grasper cam driver surface vector that is substantially parallel to said axis.

[c27] 27. A data cartridge library, as claimed in claim 26,
wherein:

said grasper cam follower has a grasper cam follower surface vector that is substantially parallel to said axis and oppositely directed to said grasper cam driver surface vector.

[c28] 28. A data cartridge library, as claimed in claim 24,
wherein:

said grasper cam driver comprises a bump.

[c29] 29. A data cartridge library, as claimed in claim 24,
wherein:

said grasper cam follower comprises:

a transitional surface that extends from a transitional surface first location to a transitional surface second location and has a transitional surface vector with a component vector that is parallel to said axis; and

a steady-state surface that extends from steady-state surface first location to a steady-state surface second location and has a surface vector that is substantially parallel to said axis.

[c30] 30. A data cartridge library, as claimed in claim 29, wherein:

said transitional surface comprises a surface that is one of the following: flat and curved.

[c31] 31. A data cartridge library, as claimed in claim 29, wherein:

said steady-state surface comprises a surface that is flat.

[c32] 32. A data cartridge library, as claimed in claim 29, wherein:

said grasper cam driver surface comprises a bump.

[c33] 33. A data cartridge library, as claimed in claim 24, wherein:

said grasper cam driver comprises:

a transitional surface that extends from a transitional

surface first location to a transitional surface second location and has a transitional surface vector with a component vector that is parallel to said axis; and
a steady-state surface that extends from steady-state surface first location to a steady-state surface second location and has a surface vector that is substantially parallel to said axis.

[c34] 34. A data cartridge library, as claimed in claim 24, wherein:
said picker further comprising:
a pusher plate that is operatively connected to said base plate such that said pusher plate is capable of moving between first and second positions relative to said base plate;
wherein said grasper is operatively connected to said pusher plate;
wherein said pusher plate comprises a pusher plate cam follower;
a pusher plate cam driver that is capable of engaging said pusher plate cam follower so as to move said pusher plate between said first and second positions.

[c35] 35. A data cartridge library, as claimed in claim 34, wherein:
said pusher plate cam driver is operatively connected to said crank.

[c36] 36. A data cartridge library, as claimed in claim 34, wherein:
said pusher plate cam driver has a surface vector that is substantially perpendicular to said axis; and
said grasper cam driver has a surface vector that is not substantially perpendicular to said axis.

[c37] 37. A data cartridge library, as claimed in claim 34, wherein:
said pusher plate cam driver comprises a cylinder with a curved side surface and an end surface; and
said grasper cam driver comprises a bump that extends away from said end of said cylinder.

[c38] 38. A data cartridge library, as claimed in claim 34, wherein:
said pusher plate cam follower comprises:
a first side surface;
a second side surface that is separated from and substantially parallel to said first side surface;
a first end surface that extends between said first and second side surfaces;
a second end surface that extends between said first and second side surfaces and is separated from said first end surface.

- [c39] 39. A data cartridge library, as claimed in claim 38,
wherein:
said first side surface of said pusher plate cam follower
comprises a dwell discontinuity that serves to prevent
displacement of said pusher plate by said pusher plate
cam driver over a range of rotation of said crank.
- [c40] 40. A data cartridge library, as claimed in claim 39,
wherein:
said dwell discontinuity is located substantially midway
between said first and second end surfaces.
- [c41] 41. A data cartridge library, as claimed in claim 24,
wherein:
said crank is capable of being used to rotate said grasper
cam driver through a range of more than 180 degrees
about said axis.
- [c42] 42. A data cartridge library, as claimed in claim 24,
wherein:
at least one of said pair of members is constrained to
move in a direction with a component vector that is sub-
stantially parallel to said axis.
- [c43] 43. A data cartridge library, as claimed in claim 24,
wherein:
at least one of said pair of members is constrained to ro-

tate about member axis that is substantially perpendicular to said axis.

- [c44] 44. A data cartridge library, as claimed in claim 24, wherein:
- said crank is capable of being used to rotate said grasper cam driver through a range;
- wherein for a first portion said range, said grasper cam driver and said grasper cam follower operate to place said members in one of said open state and said closed state; and
- wherein for a second portion of said range that does not substantially overlap with said first portion of said range, said grasper cam driver and said grasper cam operate to place said members in the other of said open state and said closed state.